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GB 1048184
GB 0826114
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B1D
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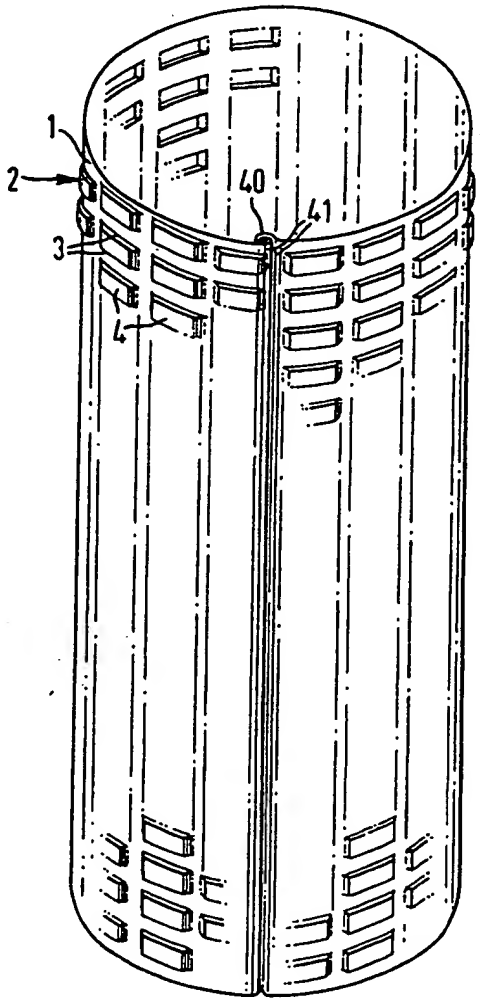
(71) Applicants
Robert Bion and
Company Limited,
(Great Britain),
27-29 Loverock Road,
Battle Farm Trading
Estate,
Reading,
Berkshire RG3 1DF.
(72) Inventors
Walter Robert Hardman
Bion
(74) Agents
J. B. King,
Kings Patent Agency
Limited,
146a Queen Victoria
Street,
London EC4V 5AT.

(54) **Filter element supports**

(57) An annular oil filter element comprises a layer of paper supported between inner and outer sleeves of perforated sheet metal as shown. The metal is perforated by passing it between rollers having respective projections and recesses, which cut an array of pairs of parallel incisions 3 through the metal and press the strips of metal 4 between the incisions out of the plane of the sheet. The sheet is then formed into a sleeve and seamed at 40.

FIG. 6.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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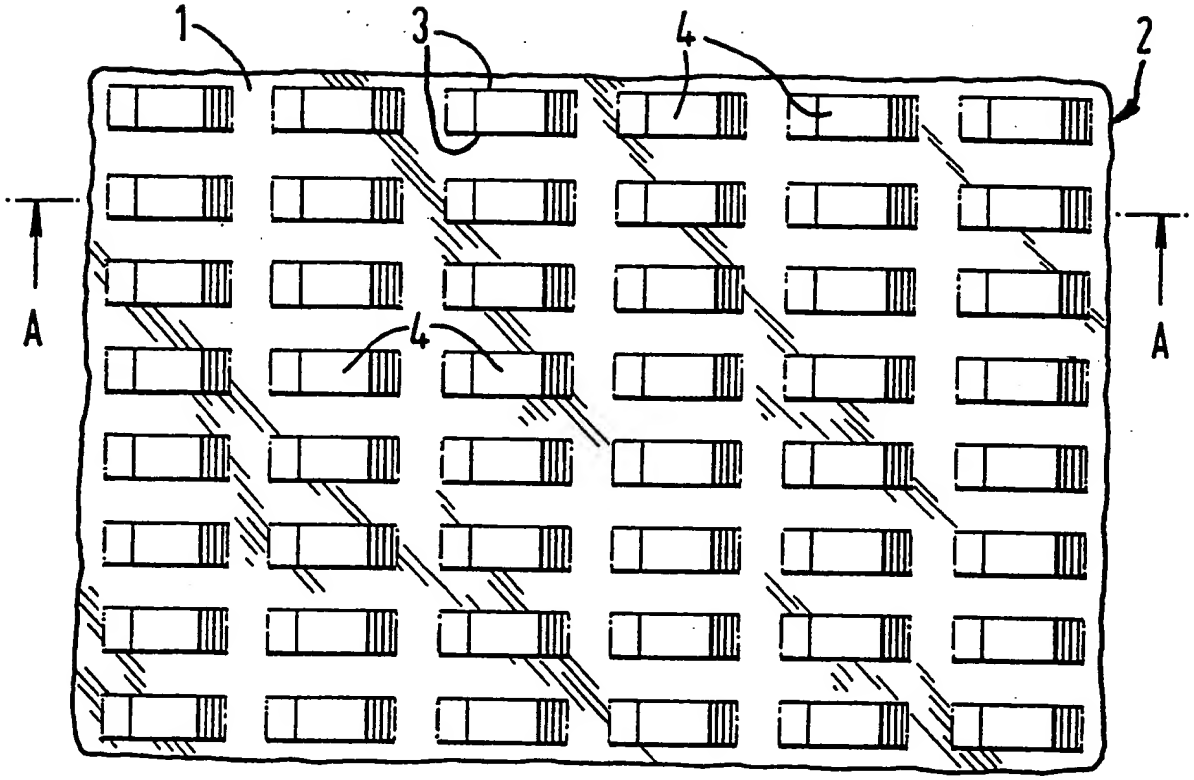


FIG. 1.

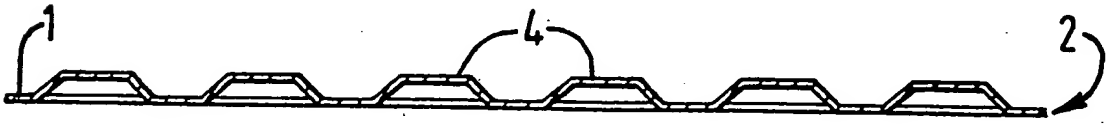


FIG. 2.

FIG. 3.

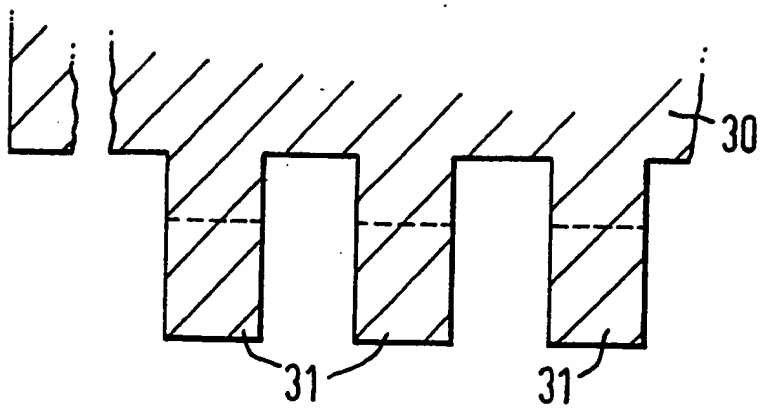


FIG. 4.

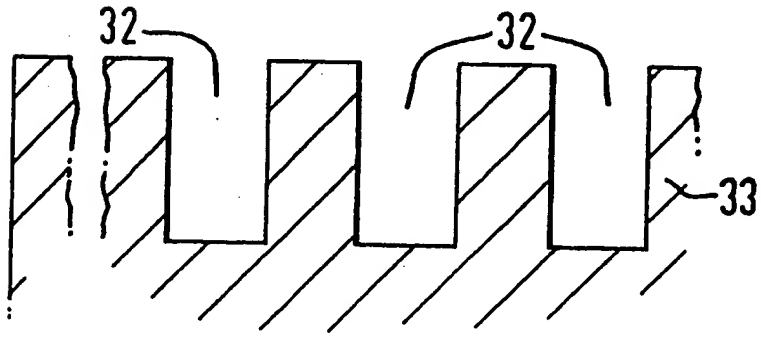


FIG. 5.

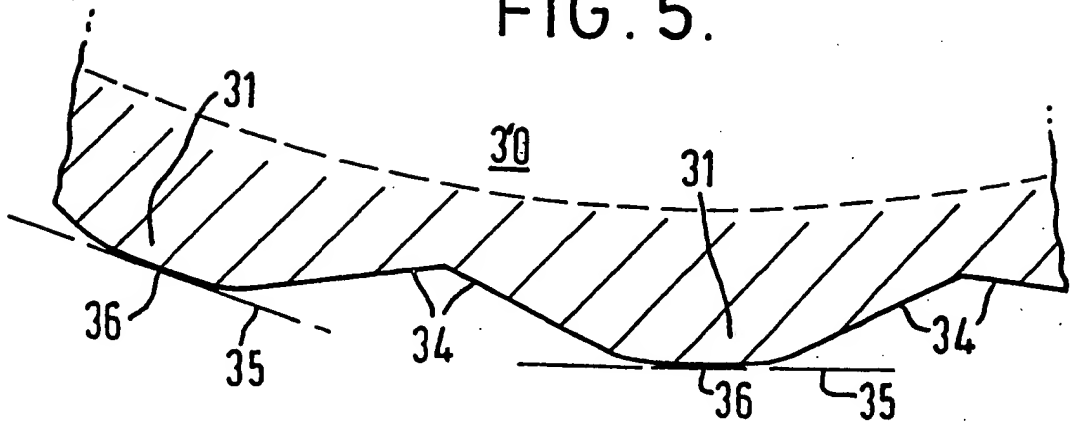
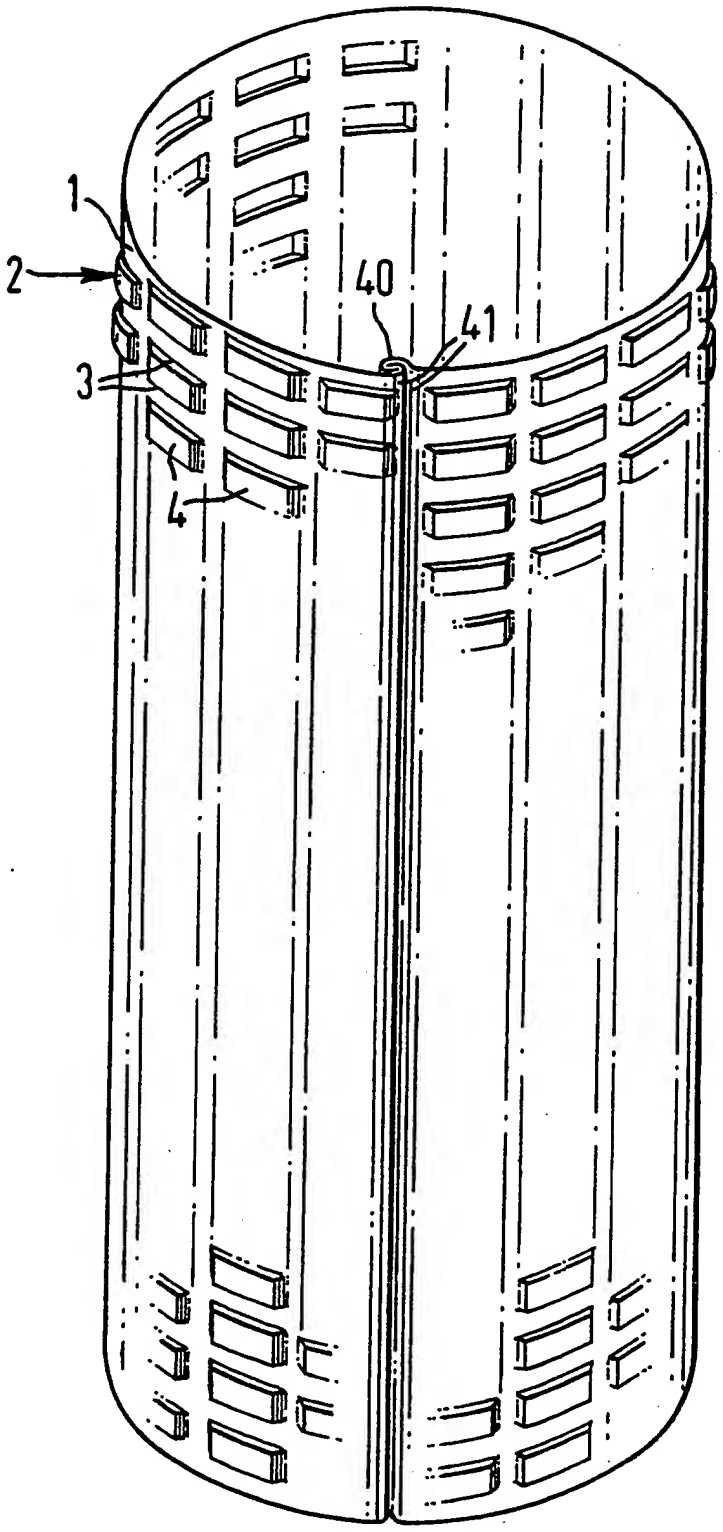


FIG. 6.



SPECIFICATION

Perforated sheet materials

This invention relates to perforated sheet materials and also to a construction of oil filter incorporating such materials.

With known methods of perforating sheet materials, for example sheet metals such as tin plate, the perforations can often have sharp projections and for certain applications these prove to be a serious disadvantage. When conventional square or round perforations are used in metal sheet a further disadvantage is the severe weakening which occurs and this can make forming the sheet difficult. This is particularly true where the perforated material is used as the main constructional body for a unit such as an oil filter as sharp portions can seriously damage and tear the highly fragible filtering medium.

it is one object of this invention to provide a perforated material which affords passage of a liquid or gas through the sheet but which does not have projecting portions which could tear or cause damage through their roughness or sharp edges. Another object is to provide a material which, although perforated, has good stiffness and strength for a given material thickness and which can be produced quickly and cheaply. A further object of this invention is to provide an oil filter unit using such material which is of simpler construction than known devices. Thus a thinner material can be used making a given construction more economical.

According to this invention there is provided a perforated sheet material wherein a plurality of deformations are made in the sheet, the deformations extending in a line in end-to-end relationship and with a number of such spaced parallel lines of deformations being provided to form a perforated area, each deformation comprising two parallel aligned incisions through the sheet with the strip of material defined between the incisions being deformed out of the plane of the sheet to form a hump.

The invention also provides a method of producing perforated sheet material in accordance with the preceding paragraph wherein each deformation is formed by two cooperating co-engaging rollers between which the sheet material is passed, one roller having a number of circumferential grooves across its width, the other roller having a number of circumferential projections in alignment with the grooves across its width, the projections each being of a generally triangular shape with the apex formed as a plateau, a plurality of deformations being produced by feeding the sheet material continuously between the rollers with the cooperating projections and grooves forming the series of derformations.

The sheet material according to the invention has a number of hump-like structures constituted by the deformations which do not include any substantially sharp edges but which nevertheless may allow for free passage of fluid or gaseous medium therethrough. The humps are longitudinally aligned and extend the length of the sheet, any number of such lines being provided across the width of the sheet.

The perforation method in accordance with the foregoing has the advantage that no material is removed from the sheet and in addition a stiffening effect is produced.

This invention also provides an oil or like filter comprising an outer body with an inner filtering element, for example of paper, wherein the filtering element is contained between two perforated sheet material structures in accordance with this invention. Preferably each sheet material structure is formed to a cylindrical shape with the curvature thereof being in the direction of a line of perforations. With such a filter an advantage is that there are no projecting portions in the perforated sheet and, furthermore, no sharp edges are presented to the paper filter element.

The circumference of the cylinder is preferably made the same as that of the rollers producing the sheet and by providing for one longitudinal line of projections to be omitted from a roller an undeformed area across the width of the sheet can be provided. This may subsequently be used to produce a connecting seam, such as a lock seam, extending the length of the formed cylinder.

The foregoing feature of the invention is primarily applicable to automobile oil filters which are mass produced.

Conventionally the perforated sheet materials used in filters are formed by a reciprocating press to effect the punching operation whereby perforations having a diameter of the order of 2 millimetres are produced. By using the material according to this invention the perforated sheet can be made using a rotary production process having a production rate of the order of 100 feet per minute. The perforations may be provided in a denser configuration due to the reinforcing effect of each hump. Thus the perforated sheet provides a better distribution of the flow through the filter than with perforated materials hitherto used.

If necessary, unperforated portions may be provided at the edges or at other discrete locations across the width of the sheet, such plain portions affording an easy method for seaming or spot welding in a subsequent fabrication process.

The invention is further described with reference to the accompanying drawings showing a sheet material and production rollers for same.

Referring to the drawings:

Figure 1 shows a plan view of a small portion of a perforated sheet,

Figure 2 is a sectional view on A-A of Figure 1,

Figure 3 shows the male perforating roller,

Figure 4 shows the female grooved perforating roller,

Figure 5 shows a side elevation of part of the roller of Figure 3, and

Figure 6 shows a perforated seamed filter tube.

As shown in Figures 1 and 2 of the drawings, a sheet material, for example tin plate of 0.5 mm thickness, has been passed through two opposed cooperating rollers having projections and grooves in respective surfaces whereby a series of deformations are formed in the sheet, the deformations extending lengthwise along a line 2. A number of

such lines are formed across the width of the sheet with the deformations in alignment.

Each deformation is defined by two parallel incisions 3 which are formed in the sheet and the material lying between the incisions is deformed so as to produce a hump 4 as shown more clearly in Figure 2. As can be seen, the hump 4 has a somewhat flattened top surface.

Any number of lines may be provided across the width of the sheet and, furthermore, the deformation may be to either side of the sheet and the same for all lines, or in an alternative embodiment a number of lines have the deformations to one side of the sheet, whereas a subsequent number of lines have deformations to the other side, such a sequence being repeated alternatively across the width of the sheet. The size of the deformations may be adapted to the particular use, and in the present embodiment the length of the incisions 3 is approximately 5 mm, the width of a deformation is 1 mm between two incisions, and a spacing of 1 mm between adjacent lines of deformations and adjacent deformations in a line is provided. The peak of the deformation may be some 1 mm above the plane of the sheet.

Figures 3 and 4 show cooperating rollers in part section with the male roller 30 having a number of circumferential lines of projections 31. These projections enter grooves 32 provided in a female roller 33, the projections and grooves forming a rotary punching press.

As shown in Figure 5, the projections 31 of roller 30 are of a generally triangular shape with sides 34 making an angle of some 25° to a tangent 35 and with a pitch of some 9° between adjacent peaks and valleys. The peaks are flattened to form plateaux 36.

This arrangement causes appropriate deformation by stretching the deformed part of the strip but without cutting through same, apart from the two parallel side incisions which are formed through the shearing action between the sides of the projections and the grooves.

The diameter of the rollers is conveniently made the same as the diameter of the cylindrical perforated element to be formed, and one longitudinal line of perforations across the roller 30 may be removed to provide an unperforated strip whereby the sheet can be cut to length, formed and seamed.

In such a production process each different diameter tube to be manufactured would require a separate male roller 30. The female roller, being plain grooved, need not be changed.

Figure 6 shows a tube for a oil filter element illustrating the seamed portion 40 formed in an unperforated area 41.

CLAIMS

1. Perforated sheet material wherein a plurality of deformations are made in the sheet, the deformations extending in a line in end-to-end relationship and with a number of such spaced parallel lines of deformations being provided to form a perforated area, each deformation comprising two parallel aligned incisions through the sheet with the strip of material defined between the incisions being deformed out of the plane of the sheet to form a hump.

2. Method of producing perforated sheet material in accordance with Claim 1, wherein each deformation is formed by two cooperating co-engaging rollers between which the sheet material is passed, one roller having a number of circumferential grooves across its width, the other roller having a number of circumferential projections in alignment with the grooves across its width, the projections each being of a generally triangular shape with the apex formed as a plateau, a plurality of deformations being produced by feeding the sheet material continuously between the rollers with the cooperating projections and grooves forming the series of deformations.

3. Perforated sheet material in accordance with Claims 1 or 2, wherein the humps are longitudinally aligned and extend the length of the sheet, a number of such lines being provided across the width of the sheet.

4. A filter element comprising an outer body with an inner filtering element, for example of paper, wherein the filtering element is contained between two perforated sheet structures formed from the material of any preceding claim.

5. A filter element according to Claim 4, wherein each sheet material structure is formed to a cylindrical shape with the curvature thereof being in the direction of a line of perforations.

6. A filter element according to Claim 5 produced by the method of Claim 2, wherein the rollers are the same diameter as the cylinder to be produced and one line of projections is omitted from the other roller to produce an undeformed strip across the sheet, the sheet being cut along the strip and formed to a cylindrical shape with a seam being provided to join the cut ends of the strip.

7. Perforated sheet material as herein described and illustrated in the accompanying drawings.

8. A method of perforating sheet material as herein described and illustrated.

9. An oil filter incorporating sheet material according to any preceding claims.

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